

LSI Docket No.: 99-284

IN THE CLAIMS:

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1. (Currently Amended) A method of creating a logical data volume in a consolidated storage array (CSA) which satisfies performance requirements for the logical data volume, the CSA comprising a plurality of storage arrays, each of the storage arrays having performance capabilities, the performance requirements for the logical data volume exceeding available performance capabilities of any single storage array, the CSA being connected to a host device executing data access software which uses the logical data volume, comprising the steps performed by the CSA of:

designating any one of the plurality of storage arrays as a primary device of the CSA;

analyzing the storage arrays for their available performance capability in light of the performance requirements for the logical data volume;

selecting at least some of the storage arrays, a combined available performance capability of which is at least equal to the performance requirements for the logical data volume;

configuring the selected storage arrays for storage spaces for the logical data volume, the storage spaces of each selected storage array containing a portion of the logical data volume;

forming volume information describing the logical data volume, ~~the storage spaces containing the logical data volume and the selected storage arrays;~~ and

sending the volume information from the CSA to the host device for configuring the data access software to access the logical data volume.

wherein the method is performed by a controller within the primary device, and

wherein any of the storage arrays may take over as the primary device in response to sensing a failure of the primary device.

2. (Original) A method as defined in claim 1 further comprising the steps of:

Page 2 of 12

Response to Office Action mailed 8 September 2003 for
U.S. Serial No. 09/732,003

CONFIGURING AND MONITORING DATA VOLUMES IN A CONSOLIDATED STORAGE ARRAY USING
ONE STORAGE ARRAY TO CONFIGURE THE OTHER STORAGE ARRAYS

LSI Docket No.: 99-284

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issuing a volume create command from the host device to the CSA to instruct the CSA to create the logical data volume in the storage arrays in the CSA;
receiving the volume information at the host device; and
configuring the data access software with the volume information of the logical data volume enabling the host device to access the logical data volume.

3. (Original) A method as defined in claim 2 further comprising the step performed by the CSA of:

monitoring whether currently utilized performance capabilities of each of the storage arrays are within a predetermined range of maximum performance capabilities for the storage arrays.

4. (Original) A method as defined in claim 3 for also managing data storage in the CSA, wherein the plurality of storage arrays includes first and second storage arrays, the first storage array containing one of the storage spaces for the logical data volume, further comprising the steps performed by the CSA of:

determining that the currently utilized performance capabilities of the first storage array is within the predetermined range of the maximum performance capabilities for the first storage array; and

migrating at least a portion of the one of the storage spaces for the logical data volume from the first storage array to the second storage array.

5. (Original) A method as defined in claim 2 further comprising the step of:

specifying at least one of the bandwidth, transaction rate, redundancy or size of the logical data volume in parameters that describe the performance requirements for the logical data volume.

6. (Original) A method as defined in claim 2, wherein the data access software includes data striping software, further comprising the step of:

Page 3 of 12

Response to Office Action mailed 8 September 2003 for
U.S. Serial No. 09/732,003

CONFIGURING AND MONITORING DATA VOLUMES IN A CONSOLIDATED STORAGE ARRAY USING
ONE STORAGE ARRAY TO CONFIGURE THE OTHER STORAGE ARRAYS

LSI Docket No.: 99-284

striping the logical data volume across the selected storage arrays.

7. (Original) A method as defined in claim 1 further comprising the steps of:
striping the logical data volume across the selected storage arrays; and
describing, in the volume information, a striping definition for a manner in which the
logical data volume is striped across the selected storage arrays.

8. (Currently Amended) A storage area network (SAN) having a host device
connected to a consolidated storage array (CSA), the host device accessing data stored
on the CSA and sending a volume create command to the CSA, the SAN comprising:

a plurality of storage arrays each having a plurality of storage devices containing
the data, the storage arrays forming the CSA and each having available performance
capabilities;

a logical data volume distributed across the storage arrays and contained on
portions of the storage devices of the storage arrays, the logical data volume containing
the data, the logical data volume having performance requirements that are higher than
the available performance capabilities of each individual storage array before the logical
data volume is created on the storage devices of the storage arrays, the performance
requirements being specified by a user of the SAN and issued by the user through the
host device to the CSA; and

a CSA primary device designated by the CSA as any one of the storage arrays and
connected to all other the storage arrays and executing volume create software to create
the logical data volume on the storage devices in the storage arrays in response to the
volume create command sent by the host device, the volume create command including
the performance requirements of the logical data volume, the CSA primary device further
executing the volume create software to analyze the available performance capabilities of
the storage arrays before the logical data volume is created on the storage devices in light
of the performance requirements of the logical data volume, the CSA primary device
further executing the volume create software to select the storage arrays for the portions of

Page 4 of 12

Response to Office Action mailed 8 September 2003 for
U.S. Serial No. 09/732,003

CONFIGURING AND MONITORING DATA VOLUMES IN A CONSOLIDATED STORAGE ARRAY USING
ONE STORAGE ARRAY TO CONFIGURE THE OTHER STORAGE ARRAYS

LSI Docket No.: 99-284

~~the storage devices to contain the logical data volume, combined performance capabilities of the selected storage arrays being at least equal to the performance requirements of the logical data volume, the CSA primary device further executing the volume create software to configure and distribute the logical data volume across the selected storage arrays;~~

~~wherein any of the other storage arrays may take over as the CSA primary device in response to sensing a failure of the presently designated CSA primary device.~~

9. (Original) A SAN as defined in claim 8 wherein:

each storage array has a maximum performance capability; and

the CSA primary device further executes performance monitoring software to monitor the performance of the storage arrays to determine whether any of the storage arrays is performing within a predetermined range of its maximum performance capability.

10. (Original) A SAN as defined in claim 9 wherein:

the plurality of storage arrays includes first and second storage arrays; and

the CSA primary device further executes volume migration software, upon a determination that the first storage array is performing within the predetermined range of its maximum capacity, to again analyze the performance capabilities of the storage arrays in light of the performance requirements of the logical data volume, and to migrate at least a portion of the data stored in the logical data volume from the first storage array to the second storage array.

11. (Original) A SAN as defined in claim 8 wherein:

the performance requirements of the logical data volume are specified by the user in the volume create command and include at least one of a bandwidth, transaction rate, redundancy or size of the logical data volume.

12. (Original) A SAN as defined in claim 8 wherein:

the logical data volume is striped across the selected storage arrays; and

Page 5 of 12

Response to Office Action mailed 8 September 2003 for
U.S. Serial No. 09/732,003

CONFIGURING AND MONITORING DATA VOLUMES IN A CONSOLIDATED STORAGE ARRAY USING
ONE STORAGE ARRAY TO CONFIGURE THE OTHER STORAGE ARRAYS

LSI Docket No.: 99-284

the volume information includes a striping definition for the logical data volume.

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13. (Currently Amended) A method of creating a logical data volume in a storage area network having a host device and a consolidated storage array (CSA) including a plurality of storage arrays, comprising the steps of:

establishing parameters defining performance requirements of the logical data volume, the performance requirements exceeding available performance capabilities of any single storage array;

sending a volume create command containing the established parameters from the host device to the CSA instructing the CSA to create the logical data volume with the performance requirements;

designating any one of the plurality of storage arrays as a primary device of the CSA;

receiving at the host device volume information from the CSA indicating that the CSA has created the logical data volume, the volume information including a striping definition of the logical data volume which describes selected ones of the storage arrays and portions of the selected storage arrays in which the logical data volume is striped across the CSA; and

configuring a host-based striping software with the striping definition of the logical data volume to enable the host device to access the logical data volume;

wherein the method steps of designating, receiving and configuring are performed by a controller within the primary device, and

wherein any of the storage arrays may take over as the primary device in response to sensing a failure of the primary device.

14. (Currently Amended) A method for managing data storage in a storage area network having a host device connected to a consolidated storage array (CSA), the CSA including a plurality of storage arrays across which a logical data volume is stored on behalf of the host device, the logical data volume having performance requirements and

Page 6 of 12

Response to Office Action mailed 8 September 2003 for
U.S. Serial No. 09/732,003

CONFIGURING AND MONITORING DATA VOLUMES IN A CONSOLIDATED STORAGE ARRAY USING
ONE STORAGE ARRAY TO CONFIGURE THE OTHER STORAGE ARRAYS

LSI Docket No.: 99-284

the storage arrays having a maximum performance capability, comprising the steps performed by the CSA of:

monitoring for a data transfer performance parameter of each of the storage arrays on which a portion of the logical data volume is stored; and

determining whether the data transfer performance parameter of each of the storage arrays on which a portion of the logical data volume is stored is within a predetermined range of the maximum performance capability for each of the storage arrays;

wherein the method is performed within a designated one of any of the plurality of storage arrays, and

wherein any of the storage arrays may take over as the primary device in response to sensing a failure of the primary device.

15. (Currently Amended) A method as defined in claim 14, wherein the plurality of storage arrays includes first and second storage arrays and the first storage array contains a portion of the logical data volume, further comprising the steps performed by the CSA of:

detecting that the data transfer performance parameter of the first storage array is within the predetermined range of the maximum performance capability for the first storage array; and

migrating at least a part of the portion of the logical data volume that is contained in the first storage array from the first storage array to the second storage array.